ENGINEERING OUTLOOK

AT THE UNIVERSITY OF ILLINOIS

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VOL. 2, No. 6, JUNE 1961

ASCE TENTH ANNUAL HYDRAULICS CONFERENCE

The highlights of the Tenth Annual Hydraulics Conference, sponsored by the Hydraulics Division of the American Society of Civil Engineers and to be held August 16-18 at the University of Illinois, were announced in the April issue of *Engineering Outlook*. More complete details of the technical program and other activities may be found in the May issue of the *Hydraulics Division Newsletter* and the June issue of *Civil Engineering*.

William H. Wisely, Executive Secretary of the American Society of Civil Engineers, will speak on "Society Affairs" at the August 16 conference luncheon. Mr. Wisely is a native of Illinois and a civil engineering graduate of the University of Illinois.

Floyd E. Dominy, Commissioner, Bureau of Reclamation, U. S. Department of the Interior, will speak on "A Challenge to the Hydraulics Engineer" at the August 17 conference banquet to be held in the Illini Union Ball Room.

For further information write to Professor J. M. Robertson, 125 Talbot Laboratory, University of Illinois, Urbana, Illinois.

MAKING THE INSIDE AS BIG AS THE OUTSIDE

A new building frame, made possible by research in the U. of I. Department of Agricultural Engineering, may revolutionize the construction of farm buildings. It has already been so successful that it has been used in many other kinds of buildings where unrestricted space was important. Builders have always been faced with the problem of keeping building interiors as free as possible from superstructure, columns, and supporting ties. Uninterrupted space is particularly desirable for farm buildings, which are often used to house machinery that is bulky and not particularly maneuverable.

The frame is made of lumber. It consists of two studs and two rafters made rigid by plywood gussets glued and nailed on each side of each angle. By doing away with the need for such interior obstructions as ties and posts, the rigid frame provides more usable space at less cost than do the conventional methods of construction. Frames can be made at home or by local lumber yards or builders, and they can be erected quickly and easily.

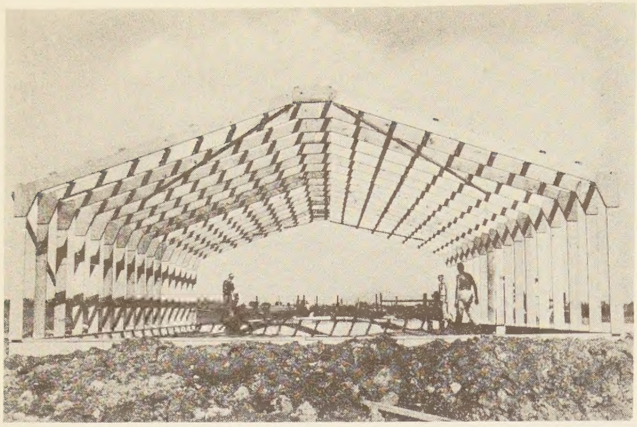
The idea of the rigid frame was first tried on a small building in 1957. In designing the framing for this building, accepted procedures of structural analysis were used to determine stresses in members. No established procedure could be found, however, for designing the nailed and glued plywood gussets which were subjected primarily to a bending load. Research was therefore undertaken to develop such a procedure. Load tests were made on a series of 88 full-scale joints formed with nailed and glued plywood gussets. Results of this research were used in designing complete building frames.

Joints were made out of construction grade Douglas fir, C-C exterior sheathing grade Douglas fir plywood, and type II casein glue. Nails were used to apply pressure while the glue set. Five sizes of framing lumber were included in the tests: 2 x 4, 2 x 6, 2 x 8, 2 x 10, and 2 x 12. Two thicknesses of plywood were tried for the gussets — ⅜-inch and ⅝-inch. Other variables were the size of gusset and the orientation of grain of the face plies of the gusset.

To design a series of rigid frames, the following loads were assumed:

1. A combined snow load and dead load of 25 pounds per square foot of horizontal projection of the roof surface.
2. A wind velocity pressure of 20 pounds per square foot at a height of 30 feet. This is equivalent to a wind velocity of 88 miles an hour at this height. A correction was then applied for the actual height of the building. The frames were designed for a load resulting from the wind blowing toward the open side of a building closed on the other three sides.

The following allowable working stresses were also assumed:



Erection of this type of structure is simple and can be done rapidly with relatively inexperienced builders. The workmen are shown erecting 2 x 8-inch frames for a 30-foot span building.

1. A stress in extreme fibre in bending of 2,000 pounds per square inch.
2. A stress in compression parallel to the grain of the lumber of 1,600 pounds per square inch.
3. A stress in shear parallel to the glue line of the plywood of 90 pounds per square inch.

Details of the joint tests are given in Agricultural Experiment Station Bulletin 654, "Design of Nailed and Glued Plywood Gussets for Lumber Rigid Frames" by J. O. Curtis. Complete details on frame spacing and fabrication are given in Agricultural Experiment Station Circular 812, "Lumber Rigid Frames for Farm Buildings" by J. O. Curtis and E. L. Hansen. This booklet includes design data for all standard stock sizes of framing lumber from 2 x 4 to 2 x 12, giving the maximum stud spacing for each for spans of 12 to 40 feet, as well as stud heights from 6 to 12 feet. It gives details of gusset dimensions for different sizes of framing, frame assembly methods, foundation plans, and roof constructions. It is available free of charge from the Department of Agricultural Engineering, University of Illinois, Urbana, Illinois.

ASTME EDUCATION AWARD

Professor Lawrence E. Doyle of the Department of Mechanical and Industrial Engineering, University of Illinois, has been named the recipient of the Education Award of the American Society of Tool and Manufacturing Engineers. The Award was presented at the National Honor Awards Dinner on May 20, 1961, in New York City at the Annual Meeting of the Society, which was attended by delegates from 167 chapters in the United States, Canada, Mexico, Australia, and the Philippines. The Award honors men "for developing dynamic curricula, fostering sound training methods, or inspiring students to enter the profession of tool engineering."

THREE CIVIL ENGINEERS HONORED

Three members of the University of Illinois Department of Civil Engineering have been selected as the 1961 winners of the A. Epstein Memorial Award for Faculty Achievement. The recipients are Dr. Benjamin B. Ewing, Associate Professor of Sanitary Engineering; Dr. Mete A. Sozen, Associate Professor of Civil Engineering; and Dr. Houssam M. Karara, Assistant Professor of Civil Engineering.

Funds for the Award are contributed by the firm of A. Epstein and Sons, Inc., Chicago, and final selections of recipients are made on the basis of achievement, scholarship, professional standing, contribution to the work of the Civil Engineering Department, and distinction in public service.

A CURRENT PUBLICATIONS CATALOG

A cumulative index titled *Publications 1904-1960* has just been published as a new edition of the catalog of publications of the Engineering Experiment Station. It lists available publications by both author and subject headings, gives prices of publications and reproductions, and a list of publications by departments. It also describes the proper procedures for ordering Experiment Station publications or microfilm and photoprint reproductions of the publications.

The 43-page catalog is available free of charge from Engineering Publications, 114 Civil Engineering Hall, University of Illinois, Urbana.

Professor James Leach of the U. of I. Mechanical Engineering Department is shown teaching a class in foundry practice at the Indian Institute of Technology (I.I.T.) at Kharagpur, India. The University of Illinois has played an important role in the development of the Institute since 1954 (October, 1960, *Outlook*). Ten other engineering professors have served on the I.I.T. faculty, and a number of the Institute's regular staff members have come to Illinois for advanced training. Professor Leach, who has just returned from India, said he has a deep respect for the students and staff at the Institute, as well as for the International Cooperation Administration, which has made the U.I.–I.I.T. program possible.

AERONAUTICAL AND ASTRONAUTICAL ENGINEERING

Teaching and research in the space age, long a part of the work of the Department of Aeronautical Engineering at the University of Illinois, has been officially recognized by a departmental name change approved by the University of Illinois Board of Trustees. The new name is the Department of Aeronautical and Astronautical Engineering.

According to Professor Henry S. Stillwell, Head of the Department, the new name is more descriptive of the work being done in the Department. This work has for years included instruction and research in the areas of missile and space vehicle engineering. Professor Stillwell points out that while the name change does not mean a new direction of interest for the Department, it does indicate the broadening of interests in this department in the last few years.

Some of the projects related to astronautical engineering worked on during the last year include studies in the aerodynamics of vehicles re-entering the atmosphere, missile aerodynamics, and investigations of high-temperature flight structures.

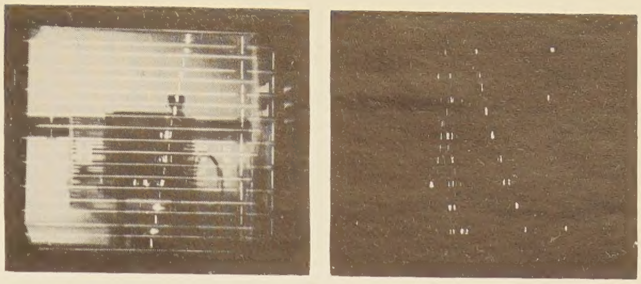
The Department's programs of instruction and research on piloted aircraft are now stronger than ever, with efforts being applied to a wide range of aircraft varying from vertical take-off and landing airplanes to high-altitude hypersonic-speed craft.

Aeronautical engineering has been broadening in scope over the last fifteen years and is expected to change even faster in the future. In its programs in education and research, the U. of I. Aeronautical and Astronautical Engineering Department plans to be as progressive as its new name suggests.

SPARK CHAMBER

The spark chamber is the newest in a long series of devices developed by nuclear physicists for the detection of high energy particles.

In this device flat metal plates are stacked parallel to each other and about ¼ inch apart. They are insulated from each other and alternate ones are electrically connected together. When a particle passes through the stack of plates it ionizes the gas between them; that is, it electrifies the gas along its path. One set of plates is then suddenly raised to a very high voltage — about 15,000 volts within half a millionth of a second. A spark occurs between the plates at the points where the gas was ionized. Sparks therefore trace out the path of the particle. The sparks are very bright and easily photographed, providing a permanent record of the nuclear interaction being studied.



The picture on the left shows the stack of parallel plates in the spark chamber with a spark path caused by a single cosmic-ray particle. The complex apparatus apparently inside the chamber is a reflection of the camera in the front glass window of the chamber. The picture on the right shows the sparks along the paths of several particles in a cosmic-ray shower.

Since the spark chamber is only sensitive for about one millionth of a second after the passage of the particle whose track is to be photographed, some other device must be employed to detect the particle and switch on the high voltage immediately after the particle has entered the chamber. This detecting device is usually a system of scintillation counters which can be arranged so that the spark chamber "looks at" only one specially selected event out of several hundred thousand which take place in it each second. In this respect it is superior to the older cloud and bubble chambers which are sensitive to all particles which have passed through them for a relatively long time before the photograph.

A group of physicists at the University of Illinois is developing these chambers for use at the Betatron Laboratory on the Illinois campus in conjunction with large accelerators at Brookhaven and Argonne National Laboratories.

THE UNDERGROUND ENGINEERS

Some people say a petroleum engineer is a chemical engineer who has gone underground. The petroleum engineer deals with all the processes and exchanges the chemical engineer deals with above ground — fluid flow, fluid displacements, phase changes, mass transfers, chemical reactions, and so on — but the petroleum engineer is interested in these processes as they occur within the rock mantle of the earth.

These processes are influenced beneath the surface by natural forces that differ from the above-ground limits of interest. Since these processes take place within a complex natural environment, almost invariably many of them are occurring simultaneously. In addition, the petroleum engineer's interests usually cover a reservoir, which may have a considerable volume, or perhaps even the interactions of two or more reservoirs.

The goal of petroleum engineering is to get possession of the liquid and gaseous hydrocarbons in the earth. This involves engineering problems related to drilling, lifting to the surface, and transporting to the refineries. Therefore the practice of petroleum engineering depends largely upon an understanding of the flow of fluids through porous media such as sandstone and limestone.

The undergraduate and graduate programs in petroleum engineering at the University of Illinois emphasize the basic principles of hydrocarbon recovery methods. In addition to a background of physics, mathematics, theoretical and applied mechanics, physical chemistry, thermodynamics, and organic chemistry, students receive training in laboratory and analytic approaches to petroleum engineering problems.

The interests of the metallurgical engineers and the mining engineers were described in the April, 1961 and May, 1961 issues of *Outlook.* These articles gave some information on the make-up of the Department of Mining and Metallurgical Engineering (as it was then named), which has for some years offered Petroleum Engineering as an option in Mining Engineering. The increasing importance of this option is reflected by the Department's new name, now the Department of Mining, Metallurgy, and Petroleum Engineering.

RESEARCH REPORTS AND THESES

The annual publication, *Engineering Departmental Reports and Theses,* is now available as Experiment Station Circular No. 70. It contains abstracts of research reports published by departments of the University of Illinois College of Engineering during fiscal 1959-1960. In many cases the reports themselves are available only as departmental publications for limited distribution.

Doctoral dissertations and master's theses written during the last fiscal year are also listed by department. The 48-page circular includes both an author and a subject index. It is available free of charge from Engineering Publications, 114 Civil Engineering Hall, University of Illinois, Urbana, Illinois.

Recent Publications of the Engineering Experiment Station

A Summary of Engineering Research 1960, 144 pp., free of charge.

Bulletin 457, *The Functions and Design of Motor Vehicle License Plates,* by John Baerwald, Delbert Karmeier, and Gordon Herrington, 61 pp., $1.25 per copy.

Bulletin 458, *Theory of Non-Homogeneous Anisotropic Elastic Shells Subjected to Arbitrary Temperature Distribution,* 36 pp., $1.00 per copy.

Bulletin 459, *On the Solution of Ill-Conditioned, Simultaneous, Linear, Algebraic Equations by Machine Computation,* by B. T. Chao, H. L. Li, and E. J. Scott, 16 pp., $1.00 per copy.

Circular 67, *Manual of Current Practice for Design, Construction, and Maintenance of Soil-Aggregate Roads,* by E. Y. Haung, 145 pp., $1.00 per copy.

Circular 68, *A Comparison of the Performance of Various Room Heating Units Used in the I=B=R Research Home,* by W. S. Harris and L. N. Montgomery, 27 pp., $.50 per copy.

Circular 69, *Proceedings, Second Sanitary Engineering Conference, RADIOLOGICAL ASPECTS OF WATER SUPPLIES,* 80 pp., $2.00 per copy.

Circular 70, *Engineering Departmental Reports and Theses, 1960,* 48 pp., free of charge.

Publications 1904-1960 University of Illinois Engineering Experiment Station. New revised edition of Experiment Station publications catalog, free of charge.

UNIVERSITY OF ILLINOIS BULLETIN
Volume 58, Number 81; July, 1961. Published nine times each month by the University of Illinois. Entered as second-class matter December 11, 1912, at the post office at Urbana, Illinois, under the Act of August 24, 1912. Office of Publication, 49 Administration Building (West), Urbana, Illinois.

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